CLAIMS

What is claimed is:

1. A face seal assembly comprising:

a seal case having an end wall portion extending in a generally radial direction, and a seal case neck extending from the end wall portion in a generally axial direction;

a seal ring rotationally fixed relative to the seal case, located radially outward of the seal case neck, having a radially inward facing surface with a seal ring bore recessed therein, and having a sealing surface;

a seal seat mounted against the sealing surface of the seal ring and rotatable relative to the seal ring;

a primary spring mounted between the end wall portion and the seal ring for biasing the seal ring sealing surface against the seal seat; and

a secondary seal having a PTFE portion and a secondary seal spring located within the PTFE portion, with the secondary seal being located between the seal ring bore and the seal case neck with an interference fit whereby a radial sealing pre-load is created between the seal ring bore and the seal case neck.

2. The face seal assembly of Claim 1 wherein the seal case includes an outer seal case wall extending from the wall portion in a generally axial direction and including a plurality of seal case teeth, and the seal ring includes a plurality of seal ring teeth interleaved with the seal case teeth to thereby prevent rotation of the seal ring relative to the seal case.

3. The face seal assembly of Claim 1 further including a seal washer located between the primary seal spring and the seal ring.

4. The face seal assembly of Claim 1 further including a sleeve that is rotationally fixed to the seal seat.

5. The face seal assembly of Claim 4 further including a grommet mounted between the sleeve and the seal seat.

6. The face seal assembly of Claim 1 wherein the seal case neck is made of a material that is hardened to a 40 Rockwell "C" minimum.

7. The face seal assembly of Claim 6 wherein the seal case neck is made of stainless steel.

8. The face seal assembly of Claim 6 wherein the seal case neck includes a sealing surface that abuts the secondary seal, and the sealing surface has a surface finish ranging from one of 4 to 8, 6 to 12, or 8 to 16 micro-inch Ra.

9. The face seal assembly of Claim 1 wherein the seal case neck includes a sealing surface that abuts the secondary seal, and the sealing surface has a surface finish ranging from one of 4 to 8, 6 to 12, or 8 to 16 micro-inch Ra.

10. The face seal assembly of Claim 1 wherein the PTFE portion of the secondary seal is made of PTFE reinforced with at least one of a polyimid, graphite, coke, molybdenum-disulfide, and bronze.

11. The face seal assembly of Claim 10 wherein the secondary seal spring has a U-shaped cross section and the PTFE portion includes a radially inner lip biased against the seal case neck and a radially outer sealing lip biased against the seal ring bore.

12. The face seal assembly of Claim 1 wherein the secondary seal spring has a U-shaped cross section and the PTFE portion includes a radially inner sealing lip biased against the seal case neck and a radially outer sealing lip biased against the seal ring bore.

13. The face seal assembly of Claim 12 wherein the face seal is adapted to seal against a high pressure, and wherein the radially inner sealing lip and the radially outer sealing lip are adapted to extend generally axially toward the high pressure.

14. The face seal assembly of Claim 1 wherein the primary spring is a wave spring.

15. The face seal assembly of Claim 14 wherein the primary spring is made of beryllium copper.

16. The face seal assembly of Claim 1 wherein the seal spring is made of stainless steel.

17. The face seal assembly of Claim 1 wherein the seal ring is made of carbon graphite.

18. A face seal assembly comprising:

a seal case having an end wall portion extending in a generally radial direction, a seal case neck extending from the end wall portion in a generally axial direction, and an outer seal case wall extending from the wall portion in a generally axial direction and including a plurality of seal case teeth;

a seal ring rotationally fixed relative to the seal case, located radially outward of the seal case neck, having a radially inward facing surface with a seal ring bore recessed therein, having a sealing surface, and including a plurality of seal ring teeth interleaved with the seal case teeth to thereby prevent rotation of the seal ring relative to the seal case;

a seal seat mounted against the sealing surface of the seal ring and rotatable relative to the seal ring;

a primary spring mounted between the end wall portion and the seal ring for biasing the seal ring sealing surface against the seal seat; and

a secondary seal located between the seal ring bore and the seal case neck with an interference fit whereby a radial sealing pre-load is created between the seal ring bore and the seal case neck.

19. A face seal assembly comprising:

a seal case having an end wall portion extending in a generally radial direction, and a seal case neck extending from the end wall portion in a generally axial direction;

a seal ring rotationally fixed relative to the seal case, located radially outward of the seal case neck, having a radially inward facing surface with a seal ring bore recessed therein, and having a sealing surface;

a seal seat mounted against the sealing surface of the seal ring and rotatable relative to the seal ring;

a primary spring mounted between the end wall portion and the seal ring for biasing the seal ring sealing surface against the seal seat;

a secondary seal having a PTFE portion and a secondary seal spring located within the PTFE portion, with the secondary seal being located between the seal ring bore and the seal case neck with an interference fit whereby a radial sealing pre-load is created between the seal ring bore and the seal case neck; and

a sleeve that is rotationally fixed to the seal seat.

20. The face seal assembly of Claim 19 wherein the seal seat is made of silicon carbide.